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### **REMARKS**

In response to the Office Action mailed February 20, 2004, the Applicant respectfully requests that the Examiner enter the above amendments and consider the following remarks. Claims 1, 11, 12, 17, 20, 21, and 38 have been amended to more clearly describe the invention. As a result, claims 1-56 are pending in the application. The Applicant respectfully requests further examination and reconsideration of the application in light of the amendments and accompanying remarks.

#### **Rejection of Claims 1-56 Under 35 U.S.C. § 112**

The Examiner rejected claims 1-56 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In particular, claims 1-16, 37, 40, and 45-46 are asserted to be indefinite because the expression "the increased porosity" in line 16 of claim 1 lacks proper antecedent basis. Claim 11 and 20 were also asserted to be indefinite because the location where the hydrocarbon compounds are added is unclear. Also, claims 17-36, 38, 39, and 41-44 were asserted to be indefinite because it is unclear to what the coke is compared in step(b) in order to determine the increased porosity and improved adsorption characteristics. Finally, claims 12 and 21 contained the terms Fluid Coking® and Flexicoking®, which are actually not registered trademarks. Claims 1, 11, 12, 17, 20, and 21 have been amended to address these

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concerns.

**Rejection of Claims 1-56 Under 35 U.S.C. § 103(a)**

The Examiner rejected claims 1-3, 7, 8, 10-17, 19-29, and 33-56 under 35 U.S.C. § 103(a) as being unpatentable over Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1. Claims 9 and 18 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1 as applied to claims 1 and 17 above, and further in view of Wasson et al. (US-PAT-NO: 4,388,152). Claims 4-6 and 30-32 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1 as applied to claims 1 and 17 above, and further in view of Yan (US-PAT-NO: 4,096,097). The Applicant respectfully traverses these rejections.

**Claims 1-3, 7, 8, 10-17, 19-29, and 33-56 are NOT obvious from Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1.** Gamson (US-PAT-NO: 3,684,697) teaches a feedstock dilution method of the delayed coking process to produce sponge coke suitable "for the manufacture of graphite and carbon electrodes used in the aluminum industry." "Hydrocarbon bottoms which have low asphaltenes contents" (e.g., below about 8 %) are added to coking feedstocks with asphaltenes content above about 13 % (as measured by ASTM D2006). Gamson teaches that the dilution of the asphaltenes content below 13 % (on its own) is sufficient to effect a change of coke

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crystalline structure from shot coke production to sponge coke production. Gamson does not teach that the asphaltenes content of the coking feedstock can still form shot coke (desolution of asphaltenes) without sufficient levels of hydrocarbons (e.g., aromatics) that behave as solvents for asphaltenes. In addition, Gamson does not teach producing a porous, sponge coke for the addition of other chemical compounds (e.g., sulfur adsorbents) for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts. Instead, Gamson teaches the production of sponge coke with characteristics favorable for the manufacture of graphite and carbon electrodes used in the aluminum industry. In contrast, the Applicant teaches various methods in the coking process to produce very porous sponge coke from coking feedstocks that normally produce shot coke in traditional coking processes. The primary method controls the coke quality via thermal process operating conditions, primarily reducing the coke drum temperature (e.g., coking cycle quench). The current invention also teaches further increasing the porosity of the sponge coke by other process means (e.g., the uniform addition of chemical compounds or agents to the coke precursor material to change the coking mechanism). Finally, the current invention teaches various methods to uniformly distribute various selected additives in the petroleum coke via the coke quench media to improve pet coke fuel properties, combustion characteristics, and environmental impacts. These methods provide the means to control the quality and quantity of the additives integrated in the modified pet

coke. In many cases, injection of these additives requires the increased porosity and improved adsorption characteristics of the pet coke (e.g., coker feedstocks traditionally producing shot coke) created by the methods and process means of the present invention. Thus, the methods of the current invention to produce porous sponge coke and further increase coke porosity and adsorption characteristics for the purpose of adding favorable chemical compounds (e.g., sulfur adsorbents) for fuel coke are distinguished over the coking feedstock dilution method of Gamson's expired patent to reduce asphaltenes content below about 13% and promote the production of sponge coke for the manufacture of graphite and carbon electrodes used in the aluminum industry; not only in methods, but also as a different purpose or new use.

The Applicant respectfully submits that DE 19540780A1 teaches a method for quenching coke with aqueous solutions of iron (II) and iron (III) salts or monoester disodium salts of succinic acid with oxyethylenenonyl phenol. However, the 700 – 1000 °C temperatures (i.e. 1292 – 1832 °F) of the unquenched coke in this referenced patent indicate that the coke that is being quenched is likely from a coal-coking process or a low temperature coke calciner. In either case, the methods described by DE 19540780A1 apparently do not teach the controlled injection of selected chemical compounds (e.g., sulfur adsorbents) via quenching petroleum coke within the decoking cycle of the coking process in the current invention. In addition, DE 19540780A1 uses types of salt solutions (vs. current invention) for different purposes, namely enhancing

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metallurgical coke performance (vs. fuel coke performance). Consequently, the Applicant respectfully submits that the methods of the current invention which provide controlled injection of selected additives via coke quench for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts are distinguished over the quenching of coke with aqueous solutions of different types of salts in a different coking process (e.g., coal coking or low temperature coke calcining) of DE 19540780A1.

The Applicant respectfully submits that the combination suggested by the Examiner would not be obvious to one skilled in the art. The combination of the production of sponge coke via Gamson (US-PAT-NO: 3,684,697) and the coke quench system with aqueous salt solutions of DE 19540780A1 is submitted to be improper because this combination would not teach the claims of this invention. Furthermore, neither Gamson nor DE 19540780A1 suggest such a combination, and one skilled in the art would have no reason to make such a combination. Gamson does not teach or suggest a thermal cracking process or method to produce a sponge coke and further increase the porosity and improve adsorption characteristics to add additional chemical compounds to improve coke fuel properties, combustion characteristics, and environmental impacts. Likewise, DE 19540780A1 does not teach or suggest a controlled, uniform integration of desirable additives via the thermal cracking process quench. Furthermore, neither Gamson nor DE 19540780A1 teach or suggest the

potential use of increased porosity and improved adsorption characteristics of the coke produced to add chemical compounds to the coke in the quenching portion of the thermal cracking process. Accordingly, there is no motivation in the prior art to combine the references as suggested by the Examiner, and the proposed combination of these references still does not teach or suggest every limitation of the present invention. Finally, the Applicant's own experience has demonstrated this combination is not obvious to ones skilled in the art. The Applicant is working with experienced coker process engineers at refineries that have been using coking feedstocks which normally produce shot coke with traditional coking operations of the prior art. None of them use the expired patented technology of Gamson to convert shot coke to sponge coke production. Yet, these coker process engineers have asked the Applicant to make this conversion and also inject the additives of the present invention. In addition, one coker process engineer has successfully tested principles of the current invention (with permission & assistance of the Applicant) to temporarily change from shot coke to sponge coke production in their commercial unit, while using a coking feedstock that normally produces shot coke with traditional coking operations of the prior art. Thus, this combination of references is clearly not obvious to ones skilled in the art.

In conclusion, the Applicant respectfully submits that the novel thermal cracking process options and methods of the current invention are (1) unobvious to one skilled in the art and (2) these distinctions of the present invention provide surprising and

unexpected results and are patentable under Section 103 because the increased porosity and improved adsorption characteristics of the modified sponge coke allow the integration of various desirable chemical compounds (e.g., sulfur adsorbents, high quality VCM, and oxygen-containing hydrocarbons) during the quench of the thermal cracking process (e.g., delayed coking) which can improve the coke's fuel properties, combustion characteristics, and environmental impacts. Therefore, Gamson and DE 19540780A1 provide no motivation to combine or modify the references as suggested by the Examiner in order to arrive at the claimed invention. Only after the knowledge presented in the specification of the current invention (e.g., novel principles of how these additives improve the pet coke's fuel properties, combustion characteristics, and environmental controls) can the uniform integration of desirable additives in a porous coke crystalline structure produce the new and unexpected results of the current invention.

**Claims 9 and 18 are NOT obvious from Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1 and Wasson et al. (US-PAT-NO: 4,388,152).** As stated previously, Gamson (US-PAT-NO: 3,684,697) teaches a feedstock dilution method of the delayed coking process to produce sponge coke suitable "for the manufacture of graphite and carbon electrodes used in the aluminum industry." "Hydrocarbon bottoms which have low asphaltenes contents" (e.g., below about 8 %) are added to coking



feedstocks with asphaltenes content above about 13 % (as measured by ASTM D2006). Gamson teaches that the dilution of the asphaltenes content below 13 % (on its own) is sufficient to effect a change of coke crystalline structure from shot coke production to sponge coke production. Gamson does not teach that the asphaltenes content of the coking feedstock can still form shot coke (desolution of asphaltenes) without sufficient levels of hydrocarbons (e.g., aromatics) that behave as solvents for asphaltenes. In addition, Gamson does not teach producing a porous, sponge coke for the addition of other chemical compounds (e.g., sulfur adsorbents) for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts. Instead, Gamson teaches the production of sponge coke with characteristics favorable for the manufacture of graphite and carbon electrodes used in the aluminum industry. In contrast, the Applicant teaches various methods in the coking process to produce very porous sponge coke from coking feedstocks that normally produce shot coke in traditional coking processes. The primary method controls the coke quality by thermal process operating conditions, primarily reducing the coke drum temperature (e.g., coking cycle quench). The current invention also teaches further increasing the porosity of the sponge coke by other process means (e.g., the uniform addition of chemical compounds or agents to the coke precursor material to change the coking mechanism). Finally, the current invention teaches various methods to uniformly distribute various selected additives in the petroleum coke via the coke quench media

to improve pet coke fuel properties, combustion characteristics, and environmental impacts. These methods provide the means to control the quality and quantity of the additives integrated in the modified pet coke. In many cases, injection of these additives requires the increased porosity and improved adsorption characteristics of the pet coke (e.g., coker feedstocks traditionally producing shot coke) created by the methods and process means of the present invention. Thus, the methods of the current invention to produce porous sponge coke and further increase coke porosity and adsorption characteristics for the purpose of adding favorable chemical compounds (e.g., sulfur adsorbents) for fuel coke are distinguished over the coking feedstock dillution method of Gamson's expired patent to reduce asphaltenes content below about 13% and promote the production of sponge coke for the manufacture of graphite and carbon electrodes used in the aluminum industry; not only in method, but also as a different purpose or new use.

As stated previously, the Applicant respectfully submits that DE 19540780A1 teaches a method for quenching coke with aqueous solutions of iron (II) and iron (III) salts or monoester disodium salts of succinic acid with oxyethylenenonyl phenol. However, the 700 – 1000 °C temperatures (i.e. 1292 – 1832 °F) of the unquenched coke in this referenced patent indicate that the coke that is being quenched is likely from a coal-coking process or a low temperature coke calciner. In either case, the methods described by DE 19540780A1 apparently do not teach the controlled injection

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of selected chemical compounds (e.g., sulfur adsorbents) via quenching petroleum coke within the decoking cycle of the coking process in the current invention. In addition, DE 19540780A1 uses types of salt solutions (vs. current invention) for different purposes, namely enhancing metallurgical coke performance (vs. fuel coke performance). Consequently, the Applicant respectfully submits that the methods of the current invention which provide controlled injection of selected additives via coke quench for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts are distinguished over the quenching of coke with aqueous solutions of different types of salts in a different coking process (e.g., coal coking or low temperature coke calcining) of DE 19540780A1.

The Applicant respectfully submits that Wasson et al. (US-PAT-NO: 4,388,152) teaches a modified delayed coking system that integrates a vertical coke calcining and briquetting subsystems to produce a desulfurized, blast furnace coke for use in the metals industry. Wasson et al. discloses the desalting of the feed to a coking zone (Col. 2; lines 43-58), but teaches nothing new about desalting technology. "The operation of desalting vessels is well-known to those skilled in the art and does not constitute a part of the present invention." (Col. 2; Lines 52-54). As such, Wasson et al. discloses nothing more than a standard crude oil desalting system. Furthermore, Wasson et al. does not teach specific salt removal performance that typically requires improvements of the standard crude oil desalting system. In contrast, the specification

of the current invention describes various means (e.g., additional desalting stages) to improve the salt removal efficiencies of the standard crude oil desalting system. The Applicant does not claim to be the first to produce a crude oil desalting system. The specification also discusses the rationale for minimizing the salt levels (e.g., sodium) in the coke precursor material to promote porous, sponge coke with desirable porosity and adsorption properties. Thus, claims 9 and 18 reflect specific, achievable concentrations that are desirable to achieve these objectives. Consequently, the Applicant respectfully submits that Wasson et al. does not teach crude oil desalting systems that have the superior performance and limitations of the current invention.

The Applicant respectfully submits that the combination suggested by the Examiner would not be obvious to one skilled in the art. The combination of (1) the production of sponge coke via Gamson (US-PAT-NO: 3,684,697), (2) the coke quench system with aqueous salt solutions of DE 19540780A1, and (3) the desalting system of Wasson et al. (US-PAT-NO: 4,388,152) is submitted to be improper because this combination would not teach the claims of this invention. Also, neither Gamson nor DE 19540780A1 nor Wasson et al. suggest such a combination, and one skilled in the art would have no reason to make such a combination. Gamson does not teach or suggest a thermal cracking process or method to produce a sponge coke and further increase the porosity and improve adsorption characteristics to add additional chemical compounds to improve coke fuel properties, combustion characteristics, and

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environmental impacts. Likewise, DE 19540780A1 does not teach or suggest a controlled, uniform integration of desirable additives via the thermal cracking process quench of the current invention. In addition, Wasson et al. does not teach crude oil desalting systems that have the superior performance and limitations of the current invention. Furthermore, neither Gamson nor DE 19540780A1 nor Wasson et al. teach or suggest the potential use of increased porosity and improved adsorption characteristics of the coke produced to add chemical compounds to the coke in the quenching portion of the thermal cracking process. Accordingly, there is no motivation in the prior art to combine the references as suggested by the Examiner, and the proposed combination of these references still does not teach or suggest every limitation of the present invention. Finally, the Applicant's own experience has demonstrated this combination is not obvious to ones skilled in the art. The Applicant is working with experienced coker process engineers at refineries that have been using coking feedstocks which normally produce shot coke with traditional coking operations of the prior art. None of them use the expired patented technology of Gamson to convert shot coke to sponge coke production. Yet, these coker process engineers have asked the Applicant to make this conversion and also inject the additives of the present invention. In addition, one coker process engineer has successfully tested principles of the current invention (with permission & assistance of the Applicant) to temporarily change from shot coke to sponge coke production in their commercial unit, while using

a coking feedstock that normally produces shot coke with traditional coking operations of the prior art. Thus, this combination of references is clearly not obvious to ones skilled in the art.

In conclusion, the Applicant respectfully submits that the novel thermal cracking process options and methods of the current invention are (1) unobvious to one skilled in the art and (2) these distinctions of the present invention provide surprising and unexpected results and are patentable under Section 103 because the increased porosity and improved adsorption characteristics of the modified sponge coke allow the integration of various desirable chemical compounds (e.g., sulfur adsorbents, high quality VCM, and oxygen-containing hydrocarbons) during the quench of the thermal cracking process (e.g., delayed coking) which can improve the coke's fuel properties, combustion characteristics, and environmental impacts. Therefore, Gamson, DE 19540780A1, and Wasson et al. provide no motivation to combine or modify the references as suggested by the Examiner in order to arrive at the claimed invention. Only after the knowledge presented in the specification of the current invention (e.g., novel principles of how these additives improve the pet coke's fuel properties, combustion characteristics, and environmental controls) can the uniform integration of desirable additives in a porous coke crystalline structure produce the new and unexpected results of the current invention.

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**Claims 4-6 and 30-32 are NOT obvious from Gamson (US-PAT-NO: 3,684,697) in view of DE 19540780A1 and Yan (US-PAT-NO: 4,096,097).** As stated previously, Gamson (US-PAT-NO: 3,684,697) teaches a feedstock dilution method of the delayed coking process to produce sponge coke suitable "for the manufacture of graphite and carbon electrodes used in the aluminum industry." "Hydrocarbon bottoms which have low asphaltenes contents" (e.g., below about 8 %) are added to coking feedstocks with asphaltenes content above about 13 % (as measured by ASTM D2006). Gamson teaches the dilution of the asphaltenes content below 13 % (on its own) is sufficient to effect a change of coke crystalline structure from shot coke production to sponge coke production. Gamson does not teach that the asphaltenes content of the coking feedstock can still form shot coke (desolution of asphaltenes) without sufficient levels of hydrocarbons (e.g., aromatics) that behave as solvents for asphaltenes. In addition, Gamson does not teach producing a porous, sponge coke for the addition of other chemical compounds (e.g., sulfur adsorbents) for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts. Instead, Gamson teaches the production of sponge coke with characteristics favorable for the manufacture of graphite and carbon electrodes used in the aluminum industry. In contrast, the Applicant teaches various methods in the coking process to produce very porous sponge coke from coking feedstocks that normally produce shot coke in traditional coking processes. The primary method controls the coke quality via coking

process operating conditions, primarily reducing the coke drum temperature (e.g., coking cycle quench). The current invention also teaches further increasing the porosity of the sponge coke by other process means (e.g. the uniform addition of chemical compounds or agents to the coke precursor material to change the coking mechanism). Finally, the current invention teaches various methods to uniformly distribute various selected additives in the petroleum coke via the coke quench media to improve pet coke fuel properties, combustion characteristics, and environmental impacts. These methods provide the means to control the quality and quantity of the additives integrated in the modified pet coke. In many cases, injection of these additives requires the increased porosity and improved adsorption characteristics of the pet coke (e.g., coker feedstocks traditionally producing shot coke) created by the methods and process means of the present invention. Thus, the methods of the current invention to produce porous sponge coke and further increase coke porosity and adsorption characteristics for the purpose of adding favorable chemical compounds (e.g., sulfur adsorbents) for fuel coke are distinguished over the coking feedstock dilution method of Gamson's expired patent to reduce asphaltenes content below about 13% and promote the production of sponge coke for the manufacture of graphite and carbon electrodes used in the aluminum industry; not only in method, but also as a different purpose or new use.

As stated previously, the Applicant respectfully submits that DE 19540780A1



teaches a method for quenching coke with aqueous solutions of iron (II) and iron (III) salts or monoester disodium salts of succinic acid with oxyethylenenonyl phenol. However, the 700 – 1000 °C temperatures (i.e. 1292 – 1832 °F) of the unquenched coke in this referenced patent indicate that the coke that is being quenched is likely from a coal-coking process or a low temperature coke calciner. In either case, the methods described by DE 19540780A1 apparently do not teach the controlled injection of selected chemical compounds (e.g., sulfur adsorbents) via quenching petroleum coke within the decoking cycle of the coking process in the current invention. In addition, DE 19540780A1 uses types of salt solutions (vs. current invention) for different purposes, namely enhancing metallurgical coke performance (vs. fuel coke performance). Consequently, the Applicant respectfully submits that the methods of the current invention which provide controlled injection of selected additives via coke quench for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts are distinguished over the quenching of coke with aqueous solutions of different types of salts in a different coking process (e.g., coal coking or low temperature coke calcining) of DE 19540780A1.

The Applicant respectfully submits that Yan (US-PAT-NO: 4,096,097) teaches a method for the preferential formation of sponge coke (vs. shot coke) "suitable for use in the manufacture of electrodes" via improved grindability characteristics. In addition, Yan does not suggest using carbon adsorption properties of the modified coke without

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removal from the coke drum and further treatment. In contrast, the Applicant incorporates the principles of this expired patent in the specification of the current invention in a novel combination of methods and "new use" for increasing the porosity and adsorption character of the pet coke to improve the ability to uniformly distribute desirable additives into the modified pet coke. In turn, uniform integration of these additives has the objective of improving the fuel properties, combustion characteristics, and/or environmental impacts of the modified pet coke, not the manufacture of electrodes.

The Applicant respectfully submits that the combination suggested by the Examiner would not be obvious to one skilled in the art. The combination of (1) the production of sponge coke by dilution of asphaltenes in the feed material via Gamson (US-PAT-NO: 3,684,697), (2) the coke quench system with aqueous salt solutions via DE 19540780A1, and (3) the addition of carbonaceous material to the feed material to promote sponge coke via Yan (US-PAT-NO: 4,096,097) is submitted to be improper because this combination would not teach the claims of this invention. Furthermore, neither Gamson nor DE 19540780A1 nor Yan suggest such a combination, and one skilled in the art would have no reason to make such a combination. Gamson and Yan do not teach or suggest a thermal cracking process or method to produce a sponge coke and further increase the porosity and improve adsorption characteristics to add additional chemical compounds to improve coke fuel properties, combustion

characteristics, and environmental impacts. Likewise, DE 19540780A1 does not teach or suggest a controlled, uniform integration of desirable additives via the thermal cracking process quench. Furthermore, neither Gamson nor DE 19540780A1 nor Yan teach or suggest the potential use of increased porosity and improved adsorption characteristics of the coke produced to add chemical compounds to the coke in the quenching portion of the thermal cracking process. Accordingly, there is no motivation in the prior art to combine the references as suggested by the Examiner, and the proposed combination of these references still does not teach or suggest every limitation of the present invention. Finally, the Applicant's own experience has demonstrated this combination is not obvious to ones skilled in the art. The Applicant is working with experienced coker process engineers at refineries that have been using coking feedstocks which normally produce shot coke with traditional coking operations of the prior art. None of them use the expired patented technology of Gamson or Yan to convert shot coke to sponge coke production. Yet, these coker process engineers have asked the Applicant to make this conversion and also inject the additives of the present invention. In addition, one coker process engineer has successfully tested principles of the current invention (with permission & assistance of the Applicant) to temporarily change from shot coke to sponge coke production in their commercial unit, while using a coking feedstock that normally produces shot coke with traditional coking operations of the prior art. Thus, this combination of references is clearly not obvious to

ones skilled in the art.

In conclusion, the Applicant respectfully submits that the novel thermal cracking process options and methods of the current invention are (1) unobvious to one skilled in the art and (2) these distinctions of the present invention provide surprising and unexpected results and are patentable under Section 103 because the increased porosity and improved adsorption characteristics of the modified sponge coke allow the integration of various desirable chemical compounds (e.g., sulfur adsorbents, high quality VCM, and oxygen-containing hydrocarbons) during the quench of the thermal cracking process (e.g., delayed coking) which can improve the coke's fuel properties, combustion characteristics, and environmental impacts. Therefore, Gamson, DE 19540780A1, and Yan provide no motivation to combine or modify the references as suggested by the Examiner in order to arrive at the claimed invention. Only after the knowledge presented in the specification of the current invention (e.g., novel principles of how these additives improve the pet coke's fuel properties, combustion characteristics, and environmental controls) can the uniform integration of desirable additives in a porous coke crystalline structure produce the new and unexpected results of the current invention.

The Applicant respectfully submits that none of these cited references teaches the potential use of increased porosity and improved adsorption characteristics of a modified pet coke to add chemical compounds to the coke in the quenching portion of

the thermal cracking process. The Applicant respectfully submits that any combination of these cited references would not be obvious to one skilled in the art. The combination of sponge coke production by dilution of asphaltenes or addition of carbonaceous material in the feed material and a coke quench system with aqueous salt solutions is submitted to be improper because none of the cited references suggest such a combination, and one skilled in the art would have no reason to make such a combination. Furthermore, none of the cited references teach or suggest the potential use of increased porosity and improved adsorption characteristics of a modified coke to integrate various desirable chemical compounds (e.g., sulfur adsorbents, high quality VCM, and oxygen-containing hydrocarbons) during the quench portion of the thermal cracking process (e.g., delayed coking) for improving the coke's fuel properties, combustion characteristics, and environmental impacts. Accordingly, there is no motivation in the prior art to combine the references as suggested by the Examiner, and the proposed combination of these references still does not teach or suggest every limitation of the present invention. These distinctions of the present invention provide surprising and unexpected results and are patentable under Section 103 because the improved adsorption characteristics of the modified coke allow the integration of various desirable chemical compounds (e.g., sulfur adsorbents, high quality VCM, and oxygen-containing hydrocarbons) during the quench of the thermal cracking process (e.g., delayed coking) which can improve the coke's fuel properties, combustion

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characteristics, and environmental impacts. Therefore, none of the cited references provide any motivation to combine or modify the references as suggested by the Examiner in order to arrive at the claimed invention.

Since the novel physical features of the Applicant's modified petroleum coke provide these new and unexpected results over any reference, the Applicant submits that these new results indicate unobviousness and hence patentability. Therefore, the Applicant respectfully submits that no combination of the cited references can support the rejection of claims 1-44 under 35 U.S.C. § 103(a). Accordingly, the Applicant respectfully requests reconsideration and allowance of the present application with the above-amended claims.

#### **Double Patenting**

Claims 38 and 39 were objected to under 37 CFR 1.75 as being substantial duplicates of claims 42 and 43. Claims 1-3, 7-29, and 33-56 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5, 11, 12, and 15-21 of U.S. Patent No. 6,168,709 in view of DE 19540780A1. Claims 1-56 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-33 of copending Application No. 09/763282. The Applicant respectfully traverses these rejections.

The Applicant respectfully submits that claim 38 has been amended to distinguish over claims 42 and 43. A typographical error had both sets of claims referring to the same independent claim: claim 17. Claims 38 and 39 have been modified to refer to independent claim 1 to address this concern.

The Applicant respectfully submits that the current invention is patentable over claims 1-5, 11, 12, and 15-21 of U.S. Patent No. 6,168,709 in view of DE 19540780A1. That is, DE 19540780A1 does not teach the use of increased porosity and improved adsorption characteristics of coke to add chemical compounds to the pet coke in the quenching portion of the thermal cracking process. As stated previously, the DE 19540780A1 teaches a method for quenching coke with aqueous solutions of iron (II) and iron (III) salts or monoester disodium salts of succinic acid with oxyethylenenonyl phenol. However, the 700 – 1000 °C temperatures (i.e. 1292 – 1832 °F) of the unquenched coke in this referenced patent indicate that the coke that is being quenched is likely from a coal-coking process or a low temperature coke calciner. In either case, the methods described by DE 19540780A1 apparently do not teach the controlled addition of selected chemical compounds (e.g., sulfur adsorbents) via quenching petroleum coke within the decoking cycle of the coking process in the current invention. In addition, DE 19540780A1 uses types of salt solutions (vs. current invention) for different purposes, enhancing metallurgical coke performance (vs. fuel coke performance). Consequently, the Applicant respectfully submits that the methods

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of the current invention which provide controlled injection of selected additives via coke quench for the specific purpose of improving the pet coke's combustion characteristics and environmental impacts are distinguished over the quenching of coke with aqueous solutions of different types of salts in a different coking process (e.g., coal coking or low temperature coke calcining) of DE 19540780A1. Furthermore, neither of the cited references provides any motivation to combine or modify the references as suggested by the Examiner in order to arrive at the claimed invention. Therefore, the Applicant respectfully submits that claims 1-5, 11, 12, and 15-21 of U.S. Patent No. 6,168,709 in view of DE 19540780A1 cannot support the rejection of claims 1-3, 7-29, and 33-56 of the current invention under the obviousness-type double patenting doctrine.

Claims 1-56 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 19-33 of copending Application No.09/763,282. The Applicant respectfully submits that Claims 19-33 of copending Application No. 09/763,282 do not contain the added step of this invention to further increase the porosity and improve adsorption characteristics of the coke prior adding other chemical compounds (e.g., sulfur adsorbents) in the coking quench portion of the thermal cracking process (e.g., delayed coking). That is, the independent claims (i.e. claims 1 and 17) of this invention add further process means to increase porosity and improve adsorption characteristics of the coke prior to the coke quench. Thus, the Applicant respectfully submits that the independent claims of this



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invention are distinguished over the independent claims of Copending Application No. 09/763,282. Hence, all claims of this invention are distinguished over all the claims of copending Application No. 09/763,282

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Conclusion

The Applicant has distinguished claims 1-56 over the cited references. Therefore, the Applicant respectfully submits that the present application is now in condition for allowance, and such action is earnestly requested.

Respectfully submitted,

Date: 8 / 20 / 04

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